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ABSTRACT

Methods of assessment to determine the nature of undergraduate college learning experiences, which have been developed or modified at Harvard University, are examined. Since the basic research objective was to determine whether change could be measured during the college years, data were gathered from freshmen, seniors, and graduates at Harvard-Radcliffe, a state college, a junior college, and a private women's college. The following areas were assessed: learning new material, sensitivity to visual and auditory stimuli, use of objects and meanings of words, cognitive styles, explaining the difference between two sets of stories in terms of a common frame of reference, ability to construct an argument, moral reasoning, logic and rhetoric of exposition, and imaginative and other qualities as measured by Murray's Thematic Apperception Test. The following themes were indicated by the findings: college major is important partly because of the long-term cognitive style students develop: interpersonal learning situations and then traditional course work affect the liberal arts influence of a college: learning styles appear to be associated with future occupation much more closely than with background characteristics: students' abilities to present effective arguments increased over the college years: and students' moral and ethical concerns increased during college. (SW)

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VALUE ADDED

MEASURING THE IMPACT OF UNDERGRADUATE EDUCATION

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VALUE ADDED

MEASURING THE IMPACT OF UNDERGRADUATE EDUCATION

Over the years there has been much psychologically and sociologically oriented research which has shown that the impact of college is rather superficial. Many of the liberalizing changes that generally take place during the student years seem to fade into a more conservative pastiche after graduation. Newcombe's pioneering study of women whose attitudes were liberalized by their Bennington College experiences and who retained their liberal positions over a lifetime seems brought into question by a flood of data, much of which has been contradictory. In a recent volume he co-authored with Feldman, they concluded that while college does produce change, it is less dramatic than earlier supposed.[1]

Even if the changes in attitudes and values that take place in the undergraduate years are transitory, we have been comforted in knowing that the intellectual skills students acquire have their economic rewards. But Richard Freeman's analyses have proven that the income differential favoring the college graduate has all but disappeared too.[2]

Nevertheless, those of us who have worked with college students and have seen marked changes in maturity, attitude, and analytical skills have felt that findings documenting lack of impact do not square with our experiences. If one glances at these studies, it becomes readily apparent that there has been relatively little exploration of the intellectual

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[1] Kenneth A. Feldman and Theodore M. Newcombe, The Impact of College on Students, Jossey-Bass, 1970.

[2] R. Freeman and J.H. Holloman, "The Declining Value of College Going," Change Magazine, September, 1975.

domain -- the area where colleges should make their main impact. Why has the primary raison d'etre for colleges not been investigated? Is a major cause the absence of methods for assessing intellectual growth? Most of the currently available instruments emphasize affective rather than cognitive growth. Those measuring cognitive development tend to represent only two poles on a continuum: at one extreme is the course examination, at the other the scholastic aptitude test. The focus of the former is too specific to provide insight into how a student's mind functions, and the latter is too general to give us much understanding. One of the best has been the work of Perry, whose developmental model provides a useful structure to examine intellectual growth.[1]

For the past three years, supported by a grant from the Fund for the Improvement of Postsecondary Education, a team of investigators at Harvard University has been working to develop methods of assessment that would enable us to better determine the nature of college learning experiences. Anne Colby, Larry Kohlberg, Reinier Kraakman, Catherine Krupnick, Nancy Lindsay, David McClelland, Karen Nelson, Paul Segel, Geoffrey Stevens, Abby Stewart, and David Winter have been central to this work. The purpose of this report is to present our approach and some of the preliminary findings; and to entice readers into seriously re-evaluating for themselves the whole area of research on the impact of the college experience.

In this project, new instruments have been developed, some student and alumni/alumnae questionnaire data analyzed, some complicated methodological procedures used. The results have been variable; some instru-

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[1]William G. Perry, Jr., Forms of Intellectual and Ethical Development in the College Years: A Scheme, Holt, Rinehart and Winston, 1970.

ments worked not at all, others gave provocative results. The next few pages review these results. The report does not represent a finished piece of work, but rather a variety of attempts to develop a dynamic approach to understanding old problems. We have found the journey exciting and we hope you will enjoy our account.

Objectives

Convinced that fruitful ways of looking at learning and maturation could be developed we began to build a number of new instruments for looking at these problems. We also modified promising tests (from other research by McClelland, Murry, Heidbreder, McKinney, Mehan, Kohlberg) and drew on previous experience, especially that of Newcombe, King and Perry.

To begin, the project needed a working definition of attributes we expected college to influence. Several sources contributed in this definition:

- Sessions with the project advisory committee provided a general framework and a set of dimensions which were refined by staff.

- Reports and statements of Derek C. Bok, Harvard President and Henry Rogovsky, Dean of the Faculty further spelled out critical elements.

- Review of the literature yielded additional perspectives.

- Preliminary research, principally interviews with students to determine perceptions of growth in college, shaped our thinking.

Out of all these efforts, it emerged that the following characteristics needed to be studied. They are listed with the tests developed to measure them.

Figure 1

Name of Test	Abilities and Characteristics Measured
1. Test of Logic and Rhetoric	Ability to communicate in writing with clarity and style
2. Analysis of Argument	Capacity to analyze problems by collecting relevant data and marshalling pertinent arguments
3. Test of Moral Development	A sensitivity to ethical considerations and a capacity to make discriminating moral and value choices
4. Learning New Material	An ability to master new concepts and materials across the major disciplines
5. Cognitive Styles	Critical appreciation for the ways we gain an understanding of the universe, to society, and ourselves
6. Profile of Non-Verbal Sensitivity	A sensitivity to interpersonal relationships
7. Alumni(ae) Questionnaires	The extent to which life's experiences are viewed in a wider context
8. Undergraduate Behavioral Questionnaires	Broadening intellectual and aesthetic interests

Given the ambitious nature of the task, the research was developed by groups who addressed each of the areas:

Figure 2

Group members	Areas
Segel, Nelson	Test of Logic and Rhetoric Cognitive Style

Figure 2 (Continued)

Group members	Areas
McClelland, Stewart, Winter	Analysis of Argument Test of Thematic Analysis Learning New Methods Profile of Non-Verbal Sensitivity Alumnae Questionnaire
Kraakman, Lindsay	Undergraduate Behavioral Questionnaire Alumni Questionnaire
Kohlberg, Colby, Candee	Test of Moral Development

We selected four different institutions of higher education for our exploration: Harvard, Radcliffe, and a State and Junior College. They represented a diverse group, which assured us that the instruments would be tested with varied student populations in differing contexts. We also added for the pilot study another private coed college and for the alumnae study a coordinate women's private college. Since the basic objective was to determine whether we could measure change during the college years, we focused most of our attention on gathering data from freshmen, from seniors and from alumni/alumnae; at the junior college sophomores were chosen, of course, rather than seniors.[1] Sample sizes are given in Figure 3.

Ideally, the study should have been longitudinal; however, constraints of time did not make that possible. As a substitute a matched sample of freshmen and seniors was selected. However, some selected students did not participate, and replacements had to be made. When the samples were compared on College Board tests and secondary school rank, the freshmen

[1]All institutions were located in New England. the majority in the greater Boston area. They ranged in size from a few hundred students to a few thousand.

turned out to be more able than the seniors, therefore, before the analyses were run, the samples were equated by removing non-matching cases.

Figure 3

	Sample Size
Pilot Testing	
Private University	42
Harvard-Radcliffe	265

	Freshman Sample Size	Sophomore Sample Size
Undergraduates		
Harvard-Radcliffe	128	105
State College	31	38
Junior College	23	22

	Sample Size
Alumni (Alumnae)	
Harvard-Radcliffe	1,151
State College	51
Junior College	34
Private Coordinate Women's College	56

The Experimental Design:

There were three common queries about our experimental design. The first and most common was, how can the impact of the undergraduate experience be determined unless (as in Campbell and Stanley) there is a control group which did not attend college? Clearly this question is raised in a rhetorical sense, for a little thought quickly makes it apparent that such a group does not exist. Even if one could find a group of equally achieving secondary school students who chose not to attend college --

which in itself is unlikely -- it would be impossible to find a sample that had the same academic and career motivation as did those who were enrolled in college.

The second question is a variant of the first; how do you know, since a non-college control group is not available, that the changes you find are not simply an expression of normal maturation?

And third, what experimental design will permit reporting on anything significant that takes place beyond temporal changes which quckly fade as the years from graduation increase?

As is true with virtually any social science research, perfect experimental and control groups are not available. If one uses different groups for comparative purposes, the problem is easily refocused -- since maturation is a universal phenomenon, any variation among our groups constitutes change independent of the universal growth pattern. As we shall see, much of the sophisticated intellectual development that we seek in our students does appear to be a function of their interaction with institutional influences -- few of the increases in the dimensions we have tried to measure are universals in the sense that they occur in everyone. Alumni (Alumnae) were an important part of the sample, for they gave us an understanding of the role of college experiences as a continuing influence in their lives.

Tests, Analyses and Findings:

The following section provides an overview of the tests and questionnaires that we developed (some interviews were also conducted -- their results were incorporated into our more structured materials), the analyses that were carried out (most were fundamental tests of significance, but

regression analysis, factor analysis and path analysis proved invaluable at times), and our findings. We tried to avoid one hobgobblin of test development -- that of standardizing a test on a sample and then explaining in glowing terms how effectively it works, especially with that sample. Our pilot samples on which we built our scoring systems were small, and at times so too were our test samples. Our results then, especially because they are so exciting, must be considered preliminary and possess a substantial need to be cross-validated.

1. Learning New Material (35 minutes)

Four learning tasks were created to examine the comparative learning abilities of freshmen and seniors. The first three (21 minutes) were in a programmed text form based on three reading passages selected from recently published material in the natural sciences, the social sciences, and the humanities.[1] The rationale for the test was that a person's major or concentration should enable him or her to learn new material in that area more efficiently than material from other areas. As the first step in the task, students were asked to answer true-false questions about the information to test their prior knowledge of the area. Then the correct answers to each of the items were given. This process was repeated and a final set of questions was scored to see how much of the information students had acquired.

Findings: These three programmed learning tests proved that seniors did not learn at a rate significantly faster than freshmen. This attempt

[1]The passage in the natural sciences consisted of a description of a new technique for locating gas and oil called the bright spot technique. The social science passage focused on the re-training of older workers as a method of getting higher returns for investments. The humanities passage was a criticism of the literary style of Belleur, a 19th century French novelist.

to use another approach to assessing learning only corroborated the traditional findings -- learning rate does not generally increase during the college years. There was, however, one important caveat: learning rate was influenced by the college major. Students concentrating in the natural sciences learned material in the natural sciences more rapidly than they learned material in the social sciences and the humanities; the same phenomenon emerged in the other areas. It appears that a facility is developed within a discipline that makes it possible for students to learn new materials within their domain more quickly than those outside it. If this finding could be cross-validated, it would provide another reason for students to chooose carefully their area of concentration. Not only does their choice lead to some mastery of a discipline itself, but it may well influence their lives over a longer period because of their increased ability to learn material within that field.

A fourth learning task (14 minutes) was based on the work of Edna Heidbreder. It consisted of associating a symbol with the right nonsense syllable. Through a serious of presentations, the student gradually learned that the nonsense syllable "narp" was associated with a spatial configuration and that another nonsense syllable was associated with the number of objects, and yet another was associated with a class of objects.

Findings: On the Heidbreder Concept Learning Test, seniors at Harvard and Radcliffe did very much better in spatial and numerical concept learning than did the freshmen. For the public colleges, the trend was the same, but the improvements were not significant.

2. Profile of Non-Verbal Sensitivity (PONS) (12 minutes)

Robert Rosenthal developed this test to provide a measure of a sub-

ject's sensitivity to visual and auditory stimuli. The test consisted of two parts. The first was a movie of a woman portraying various emotions. Only the second part, however -- a garbled audio tape recording -- was included as part of our test battery. The audio tape was altered from normal speech in two ways. In the first section, the frequency bandwidth was reduced so that words themselves were incomprehensible, although the tonality of the speech remained. The listener had to rely on his/her intuitive understanding to ascertain which emotion was being expressed. In the second portion of the tape, the full range of the speech frequency remained, but the order of the syllables was rearranged. In order to understand the words, a high degree of analytical ability was required to take bits and pieces of the soliloquy and reassemble them into something understandable. Students were asked to identify from these snippets of disturbed speech whether, for example, it was the voice of someone nagging a child or saying a prayer.

Bales and Rosenthal found that a group dynamics course designed to increase interpersonal sensitivity (Harvard's Psychology and Social Relations 1200) did increase scores on this test. In another context, McClelland found that United States Information officers judged as outstanding in their work abroad had significantly higher PONS scores than did officers whose work was average.

Women, in general, score higher than men on the Profile of Non-Verbal Sensitivity Test. Matina Horner feels that this extra sensitivity can be a handicap for women, who may allow their sensitivity to keep them from pushing ahead for achievements that they might otherwise have made. Men, on the other hand, might benefit from being more thoughtful and sensitive

to those around them. President Horner feels that a better balance should result from the college experience. The findings that follow on cognitive style suggest that it is not simply sex alone, but approaches developed by different disciplines that contribute to more or less intuitive, sensitive stances.

Findings: The senior women in our sample were less sensitive than freshmen women, but the sensitivity of senior men was no greater than that of freshmen men.

3. Uses of Objects and Meanings of Words (15 minutes each)

The goal was to think of as many different ways as possible for an object like a "barrel" or as many different meanings for a word like "sick." Liam Hudson conceived of these tests as measures of divergent thinking, to be contrasted with the synthesis, analysis, and convergent thinking required in more traditional measures. While this task has some similarities to vocabulary tests found in measures of intelligence, it differs in that it requires the subjects to generate meanings on their own.

Findings: Seniors (sophomores at Junior College) from all three colleges scored significantly higher on the Uses of Objects and Meanings of Words tests than did freshmen. Going to college seems to promote verbal fluency generally. The scores from the first to final years did not differ at the three colleges sampled although one could argue that a ceiling effect might have been present for Harvard and Radcliffe students since they are higher on the scale.

4. Cognitive Styles (25 minutes)

The term "cognitive style" usually refers in general to the way people think and learn. There are fifteen or twenty cognitive style models use-

ful for addressing different aspects of information-processing, and they share several assumptions about the difference between an assessment of cognitive styles and the more usual assessment of abilities. The primary difference is that abilities are uni-polar measures while cognitive styles are bi-polar. Any cognitive style is vaulable since each of the attributes is of virtually equal importance, e.g., field dependent or field independent; with abilities this is of course not true -- to possess verbal fluency is good, to lack it is bad.

The model of cognitive style that we have chosen to explore was developed by James McKinney. Essentially, his theory posits that there exist three major cognitive dimensions -- an intuitive-systematic dimension, a receptive-preceptive dimension, and a data dominant-strategy dominant dimension. While everyone possesses all of these traits, most people have predominant intellectual styles. For example, one could be high on intuitive-receptive skills, indicating an openness and receptivity to new data with a capacity for quick insight into complex situations. On the other hand, one could be high on preceptive-systematic skills, representing an ability to fit new data into pre-established categories along with a systematic-analytical approach to problem solving. Many permutations are possible: intuitive-preceptive and systematic-receptive are also equally possible cognitive styles. One could also have a dominance of a single dimension, e.g., intuitive, or be data or strategy dominant.

Five short, timed tests designed to measure these styles were entitled Road Signs, Scrambled Words, Diagram Relationships, Identical Pictures, Paper Folding. Road Signs asked for creative ways of signaling travellers of the road with visual cues which would identify such items as the presence of a restaurant. Scrambled Words consisted of four letters which, if ordered

correctly, became a common word. If the letters were unscrambled logically and systematically, which was certainly possible, it was much slower than if the task was approached intuitively. Diagramming Relationships were Venn diagrams which required a logical approach for solution. Identical Pictures required a logical approach for solution. Identical Pictures required high analytical attention to detail and Paper Folding required an ability to sequentially analyze a process; an intuitive leap was impossible.

Essentially Road Signs required preceptive skills; Scrambled Words intuitive skills; Identical Pictures receptive skills; and Paper Folding systematic receptive skills. Verbal and graphic item styles were used in an attempt to free the format from the required ability.

The tests had stringent time limits so that a student under pressure would be forced to permit his or her dominant style to come to the fore.

Findings: If one defines a predominant cognitive style as requiring differences in categories of 2 septiles or greater, significantly more seniors than freshmen have distinctive cognitive styles. This suggests that cognitive differentiations do increase over the period of the college years. Since cognitive styles are related to college major, departmental experiences may play a causal role. For example, the particular styles found among seniors who are natural science majors tend to be systematic and strategy dominant; social science majors tend to be data dominant; and humanities majors preceptive.

Women are more often intuitive and preceptive than men but the differences were not as pronounced as for college majors. When the influence of the major was factored out, sex differences virtually disappeared.

We explored the differences among the four colleges included in our sample and found no differences in patterns of cognitive style.

There were several provocative correlates between cognitive style and other variables for seniors:

- Harvard and Radcliffe seniors with strategy styles reported more than average contact with the faculty.

- A pronounced cognitive style of any kind appears to be associated with a sense of confidence in the choice of college major. Those with strategy and systematic styles are also most confident about their career choices; intuitives are uncertain about the future but have considered many more options than the neutrals.

Cognitive style was related to academic satisfaction with major and at times to career choice, yet the findings (while statistically significant) are not always dramatic. Even if they were, it is only fair to wonder if students would receive the best education if they always found themselves in an environment with which they felt congruent. As Bill Perry has suggested, the discrepancy of styles may provide the "divine itch" that is the motivation one needs to see the world from yet another point of view.

5. Test of Thematic Analysis (30 minutes)

This test attempts to measure the degree to which an individual is able to extract and lucidly describe the crucial and contrasting constructs in two subsets of materials. Students were presented with two groups of of imaginative stories, consisting of four stories each. They were asked to study the stories carefully, and to determine the features that were present in one group and absent from the other.

A coding system was designed to assign low scores to pre-critical judgment, such as "apples and oranges." Higher scores were assigned to stories in which the student used well structured analytic categorizations.

Findings: Harvard freshmen are better at explaining the difference between the two sets of stories in terms of a common frame of reference than are the students at the two other colleges. But Harvard seniors were even more effective; they were better at formulating categories and more often correct in identifying the "power" themes — the fundamental concept which actually separated the two sets of stories. Harvard students appeared to develop the intellectual skill of concept formation more than did the other students involved.

6. Analysis of Argument Test (12 minutes)

An excerpt was selected from a sermon by the Reverend Norman Vincent Peale in which he was criticizing the permissive child rearing practices advocated by Dr. Benjamin Spock, claiming that these practices were creating moral lassitude among the young and the most undisciplined age in history. After reading the article, students were asked to write a response to it (it was assumed, and correctly so, that students would argue against his position). This appeared to be a relatively easy task; they were then asked to reverse their stand and argue in Peale's behalf. The scoring system devised gives credits in proportion to the quality of the argument, its analytical strength, the logic of its organization.

Findings: The results were striking; the scores of seniors (or sophomores) were significantly higher than those of freshmen at all three colleges. The changes in scores at State were not as large as at Harvard, but Junior College increases (especially considering that the period of education was only half as long as that at Harvard) were impressive. Harvard still scored significantly higher, as would be expected after longer exposure to quality education.

As McClelland writes, it is reassuring to be able to demonstrate that a college education does improve reasoning ability. The Harvard-Radcliffe data effectively illustrate that seniors are not only able to attack an unpopular stand, but to defend it as well. It is especially in this latter quality that their performance exceeds that of students from the other colleges.

7. Kohlberg's Test of Moral Development (untimed, approximately 30 minutes)

According to Kohlberg, the three basic levels of moral development are: 1) pre-conventional, using essentially obedience and punishment modes of behavior; 2) conventional, using the performance of good or right roles; and 3) post-conventional, using conformity to self ideals and shared norms. Each of these basic stages has two categories or six altogether. The pre-conventional level at stages one and two are highly egotistic. Stage three is symbolized by the good boy-good girl syndrome and stage four is a continuation of authority and social order. Stage five begins the search for shared norms but still operates in a contractual-legalistic framework. Stage six is the conscience or the principle orientation stage. The data Kohlberg used to determine the stage of moral development come from situations in which students are asked to resolve moral dilemmas. These dilemmas have previously been oral interviews but have, as part of this research, been transformed into written interviews containing sufficient elaboration so that they can be scored according to the Kohlberg stages.

Findings: For students in the Value Added Project, the Moral Judgment scores ranged from 250 to 507 (Stage 2/3 to Stage 5). There were significant differences between freshmen and upperclassmen at each of the

three schools. Men attained higher scores than women except at Harvard, where there were no such sex differences. Harvard students had higher scores than State students who in turn had higher scores than Junior College freshmen and sophomores. While social science concentrators had the highest mean score, and natural science concentrators the lowest, differences by field of concentration were not significant -- either at Harvard or at the other colleges.

Although upperclassmen have higher scores than freshmen on the Moral Judgment Interview, the absolute difference is not impressive within the stage theory itself.

Figure 4

	Harvard		State		Junior College	
	Freshman	Senior	Freshman	Senior	Freshman	Sophomore
Below Stage 4	43.6%	30.8%	72.7%	44.4%	72.0%	57.7%
At or above Stage 4	56.4%	69.2%	27.3%	55.6%	28.0%	42.3%
Chi Square =	4.107		5.493		1.144	
p =	.05		.025		n.s.	

Since the mean scores for both freshmen and seniors at Harvard are at Stage 4, and somewhat higher than at State and Junior College, these data raise two major questions. First, why do Harvard freshmen have significantly higher scores than other freshmen? And second, why do Harvard seniors differ so little from Harvard freshmen? We can only speculate about the possibilities:

first, Kohlberg's reference to rational operations is related to Plaget's theory of cognitive development which has formal operations as its highest stage. Formal operations are basically hypothetico-deductive reasoning abilities, and Kohlberg argues that formal operations are necessary though not sufficient for the growth of moral judgment. This argument seems reasonable since moral judgment develops as both a function of the ability to recognize moral issues in a hypothetical situation and the ability to reason hypothetically and generate principles. Harvard freshmen may simply have more experience or expertise with formal operations than the other freshmen, therefore giving them an advantage in dealing with the moral dilemmas.

How can the small differences between freshmen and seniors at Harvard be explained relative to the substantial score gains at the State and Junior college? A possible theoretical explanation for the greater stage progress at the State and Junior colleges involves the ease of stage transition. While movement from Stage 3 to Stage 4 requires only an elaboration of role-taking to include a larger social context, principles reasoning requires, according to Kohlberg, "a clear effort to reach a personal definition of moral values—to define principles that have validity and application apart from the authority of groups or persons and apart from the individual's own identification with these groups." A possible explanation for small stage progress at Harvard suggests that it is simply more difficult getting to Stage 5 than getting to Stage 4.

A second theoretical explanation is based on the relationship between moral reasoning and the moral atmosphere. Progress in moral reasoning is fostered by a just environment. Not only is it more difficult to move

from Stage 4 to Stage 5 reasoning, but the environment may foster Conventional reasoning and thereby add further difficulty to Stage 5 transition.

8. Logic and Rhetoric of Exposition Test (25 minutes)

Among Harvard alumni two of the most frequently cited long-lasting effects of college were capacity for self-expression, verbal or written (70%), and the ability to think clearly (66%). While it is encouraging to know that, in the minds of its graduates, college fosters the development of these skills, we wanted to be able to measure the degree to which this development is taking place among the contemporary undergraduates.

It seemed impossible to identify a single essay topic which would elicit abilities to organize and present ideas without favoring students with particular backgrounds and interests. Therefore, we presented five different topics from which students were to select one. This test also provided us with another opportunity to examine cognitive styles of students. All essays were coded for spelling, grammar, and organizational flaws. In addition each topic was coded for the quality of the arguments and counterarguments presented.

Findings: While we would like to report that seniors composed more forceful and logical essays, made fewer syntactical errors, and even spelled better than did freshmen, we cannot. In truth, there was a group of natural science seniors who were very able by SAT standards who did very poorly--much more so than their freshman counterparts. We must report only that humanities and social science seniors wrote with a finer pen than did the freshmen.

Category scores were correlated with the cognitive style test scores. Each was found to be statistically significant and oriented correctly; however, the magnitude of the relationship was not particularly impressive.

9. Thematic Apperception Test (20 minutes)

Henry Murray's TAT's were used to measure qualities of mind that might be affected by a college education. This test provides a method of obtaining insight into a person's fantasies, thus revealing a sense of their personal dynamics.

Students were asked to write a brief, imaginative story about four different pictures. Several new as well as traditional coding systems were applied to these stories.

Self-definition or cognitive maturity: Several years ago Abigail Stewart devised a coding system for comparing stories of undergraduate women who had definite career plans with those who did not. Later she found that this code was quite useful in distinguishing among women who had careers later in life. Basically the coding system gives positive points for attempts in the story to solve problems, to describe events in terms of cause and effect relationships. Negative points were given for passive descriptions of the people and what happened to them. The quality of mind involved is the tendency to gather data, to analyze and solve problems, and to understand relationships. Thinking in terms of causal explanation seems to define cognitive maturity because the person actively reasons and thinks things through.

Findings: The impact of college education was dramatic and significant at all colleges and significantly greater at Harvard and Radcliffe. Harvard seniors scored much higher than did final year students at the other two colleges. Since there are differences among the college population, it would appear that cognitive maturity is much more a function of education than of aging. Seniors are not only more competent at

reasoning, they actively search for the reasons behind these events. As McClelland states, the former is a skill, the latter a quality of mind.

Social-Emotional Maturity: A coding system was developed based on Erik Erikson's model of psycho-social or psycho-sexual development. This code has shown promising validity in ascribing characteristics appropriate to Erikson's specific stages. Scoring is determined by the extent to which an individual's stories show characteristics assigned to each of the four stages. In stage 1 (the intake stage) the individual describes authority as benevolent. Characters are described passively rather than actively. In stage 2 (the control stage) authority is described as critical and characters in the story repond to criticism by taking action to resolve the matter. In stage 3 (the assertive stage) authority is described as something to be rebelled against, and the main action is assertion or aggression. In stage 4 (a stage of mutuality or generativity) personal authority is no longer relevant, and individuals are described as acting in terms of institutional or value norms, and they are perceived as regulating their actions in order to fit appropriate behavior patterns. This scoring system is designed to be internally consistent such that if a person's score is at, say stage 3, he or she would already have achieved stages 1 and 2.

Findings: The initial as well as the change scores were most provocative. The freshmen scores at State and Junior college are a bit higher than those at Harvard. However, for these two schools, the senior scores were very little changed while there was a very large increase for Harvard seniors. It would appear that these changes may be a reflection of a residential college which assumes an interest in the social development

of its student body.

Motive Scores: For nearly thirty years TAT's have also been used to obtain measures of an individual's need for achievement, affiliation or power (see McClelland et. al. 1963, Atkinson, 1968, and Winter, 1973). These measures are germane to our study because research has shown that achievement, affiliation, and power motives are important factors in determining how individuals choose to live their lives. Consequently, we are interested in ascertaining whether or not undergraduate education generally affects such motives. For example, if a college increases the need for achievement, that means its graduates will tend to spend their time improving, making things more efficient. If a college increases the need for power (particularly if there is a concomitant high sense of control as reflected in an activity inhibition score--also obtained from the stories) its graduates will likely enter into and be more successful at managerial occupations. A fourth motivational variable of interest is fear of success, originally defined and discussed by Matina Horner (1963). If a college increases fear of success among women, they will be less likely to pursue a career even though they are able to do so (Stewart, 1975).

Findings: David McClelland drew upon his files and found that the need for achievement showed a marked and significant increase from freshman to senior year at Harvard and at another private college in 1960. There was, however, no corresponding increase in the current data. He suggests that the climate of the country is sceptical about the chances of accomplishment, and as a result, student scores were low and there was no gain in any of the three colleges from freshman to final year.

Harvard and Radcliffe students scored lower on the need affiliation than students at State or Junior College; they are less concerned about

establishing friendships. And further, affiliation scores declined at all three colleges, almost significantly so at Harvard.

On the need for power or hope for power scores, the gain from freshman to senior year at Harvard is sizeable and almost significant. As McClelland has demonstrated elsewhere, when the hope for power is combined with a sense of control, people tend to be institution builders. It is these qualities that Harvard and Radcliffe particularly seem to foster in contrast to the other colleges. And finally, motive score "fear of success" appears to have increased in Radcliffe women and declined in Harvard men and in both women and men at State and Junior College. This may simply be a reflection of the way Radcliffe women perceive their competition with men in the traditional male occupations of law, medicine, and graduate school.

Alumni(ae) Analyses

The retrospective evaluation by alumni/alumnae of "sources of learning" and their current sense of "long-term influence," provides an understanding of the enduring impact of a college experience.

The most striking finding of this study was the general level of satisfaction that was expressed by Harvard alumni. Seventy percent felt very satisfied with their undergraduate experience while only 10% felt little satisfaction. Seventy-two percent also felt that Harvard has had a strong overall influence on their lives. This, of course, does not imply that nostalgia has erased their negative feelings, for 35% also indicated that their Harvard experience was also quite frustrating.

Academics were rated as the source of both the greatest satisfaction and frustration. The source of learning as seen retrospectively by alumni

is remarkably similar to that perceived by current undergraduates. Assigned readings, for example, heads the list as the most dominant influence for freshmen, seniors and alumni.

In examining the impact of the college experience from the vantage point of the current alumni occupations, we found that they profited from different types of learning experiences. Professors and lawyers felt that Independent Intensive Learning experiences (writing a thesis, seminars, tutorials, and personal contact with the faculty and tutors) contributed most to their education. Businessmen more than the other occupational groups found interpersonal learning (extracurricular activities, house experiences, personal contact with faculty, and bull sessions) the highlight of their educational activities. Professors and doctors found that traditional forms of learning (course lectures, assigned reading, preparing for and taking exams) provided especially useful experiences. If after 10 years these modes of learning were still recalled with such clarity, clearly their importance during the college years had to be pronounced. To facilitate students' development, intensive, interpersonal and traditional modes must all be part of a college program.

Since so many of the alumni felt that Harvard had a strong influence on their current lives, it is rather provocative to explore the sources of this influence. Using a regression analysis, we found that the primary source of the influence came from the "liberal arts factor." This broadening, liberalizing impact was the most important influence of the undergraduate experience--it still affects the lives of its alumni. It in turn was most highly related to interpersonal learning and secondly to traditional learning.

In other words, interpersonal learning (consisting of extracurricular activities, the house experience, personal contact with faculty, bull sessions and contact with house tutors) does indeed provide an essential component of college life and is logically part of the liberal arts influence. Freed from earlier environments and narrowing vocational college pursuits, students interact with a variety of ideas, opinions and people. Traditional learning, or classroom experience, is also tied to the liberal arts influence. In Harvard's case, courses outside the major were cited as adding to this breadth of concern and interest.

Three-quarters of our respondents had chosen four equally popular careers: law--18.7%; business, usually in a managerial capacity--19.2%; medicine--17.3%; and college or university teaching--18.7%. Path models were constructed to determine if ovcational decisions could be explained by such variables as aspirations, college achievement, and father's occupation. The models were best in accounting for the vocational decisions of doctors and worst in the case of professors. Though most decisions were made while still in college, only a moderate portion of these choices can be explained in terms of pre-college plans or achievement during college. For lawyers and doctors, the overall relationships between social economic status and vocational choice were insignificant ($r = .00$ and $.02$ respectively). Academics were somewhat more likely to have high status fathers, while for businessmen, the converse held; yet these relationships were also too small to take seriously ($r = .05, -.06$). Test scores proved to be not nearly so influential for career choice as pre-college aspirations. In their actual choice of careers, respondents tended to limit themselves to the range of options which they had, in aggregate, staked out before coming to college. But within this range, respondents frequently switched choices. Not

surprisingly, college achievement was an important factor in determining who of the many would-be academics stuck to their original aims, and who dropped into other professions or business. Would-be doctors and lawyers were less attracted by the rewards and sanctions of academic performance, and tended to be more loyal to their original career goals. Lastly, the businessman choice was in part a reaction to lower than average college achievement; most businessmen had originally aspired to a professional occupation. In every case, we found a certain direct inheritance of father's work role which asserted itself even when aspirations and achievement were controlled--an effect that was most pronounced for sons of doctors. Taking all of these considerations into account, however, we can still explain only a modest fraction of the variance in vocational choice.

We attempted to judge success within each profession by using several criteria in addition to income. For lawyers, graduate honors and law school prestige were the only two variables that exercise a direct influence of any significance on success. Moreover, of these two factors the measure of college achievement was by far the more important. The skills and attitudes which make for high college performance are also modestly important for success in the legal profession, and second, they are very importatn indeed for admission to law schools. Further, a diploma from even a prestigious institution makes a small but significant contribution to success above what we would expect on the basis of college performance alone.

For college professors, college achievement registered the highest direct path to success and had the largest overall correlation ($r = .20$). But "large" here is relative, for one surprising feature of the model was the meager size of all paths to success, including the one for graduate honors. Among the social scientists, the high road to success ran through

a prestigious graduate school, and college performance added relatively little beyond helping to achieve this end. For natural scientists, however, the chief determinant of success seems to have been college achievement; and beyond its influence, the added contribution of a prestigious graduate department was, if anything, marginally negative. The humanities model was at least as puzzling as the other two, and its most striking feature was the peculiar role of MAT scores. Not only were low quantitative test-taking abilities the best overall predictor of success among humanities professors ($r = -.24$), but also the direct negative path from MAT to success seems to have been the only influence on the latter that is substantial enough to survive the scrutiny of tests of significance. These results point to the direction which any more thorough-going study of the line between personal attributes and academic success must follow; namely, toward an investigation of multi-dimensional cognitive styles rather than single, vertical measures of ability.

We found that in medicine, unlike other professions, early aspiration seemed to exercise a significant influence on the occupational outcome. When examining income, lawyers and businessmen dominated the top of the distribution and were separated by a sizeable gap from the remaining job categories. As the doctors leave their residencies they will join lawyers and businessmen at the high end of the spectrum.

We also noted that "time on the job" had the single most consistent influence on income across categories, and that its effects are largely independent of other background factors. Time was especially potent in the case of lawyers, no doubt because large law firms have uniform sequences of pay gradations that correspond to the steps leading from junior associate

to full partner. But in other categories, Time seems to have represented no more than the "natural" effects of promotion in middle-class jobs anywhere. Such influences accounted for between 2% and 5% of income variance. The income results, then, were no more dramatic than those for success. A respondents' choice of careers had a substantial influence on his early income, but following that, the contribution of our background variables ranged from modest in a few instances, to insignificant in most cases.

As far as job satisfaction is concerned, almost 39% of all respondents described themselves as "very satisfied," while 10% claimed to be "very frustrated." The balance is overwhelmingly positive, and the image it conjures up is one of hard-working professionals who, in spite of the annoyances of demanding jobs, are basically enthusiastic about their positions. There were distinctions among occupations; lawyers were the least frustrated, artists/outsiders qualified as both the most frustrated and the most satisfied, and technical professionals were the least satisfied. Two factors constitute tools for disaggregating the meanings of our summary variables. The first of the factors was "social" dimension: occupational freedom, followed by authority, co-worker recognition of achievements, and quality of social environment. The second factor, "individual work involvement," included spending time on job-related problems after hours and the "intrinsic interest" of work content. In the social factor, we note that only one occupation emerged as significantly higher than the others--law. It is the lawyers who reported the most autonomy, authority and social recognition of their achievements; and, at least at this stage in their careers, they came closest to realizing the classic

rewards of professional status. In the second factor, work involvement, teachers, professors, and doctors stood out. This finding confirms the proverbial dedication of practitioners in these occupations to the substance of their work. It seems likely that the roles of academic or medical research, healing, and teaching are, on the average, more task-bound and less oriented toward social interaction with peers and superiors than other occupational roles. And indeed, lawyers and businessmen scored significantly below average on the individual work involvement factor.

An additional thousand dollars in reported income "buys" the average respondents in six of the eight occupations almost the same sense of increased income adequacy. In two job categories, however, income exercised an unusually potent influence on perceived adequacy; that is, among professors (the occupational group with the greatest equality of income) and among technical professionals (the group with the least income equality). Perhaps the fact that academic pay scales are particularly uniform and narrow-ranged accounts for the sensitivity of professors to small absolute increases in income. The explanation for technical professionals was not as obvious.

Career choice, then, is modestly related to measures of academic ability, father's occupation, and early aspirations, and further, both success and income are weakly tied to the complex of graduate school prestige and college performance. At each of these two stages, the web of effects extending from the average respondent's "original position" to our outcome variables became more tenuous. But at the final and most important stage, namely, how respondents felt about their work (and by extension, the quality of their lives), the web of influence breaks off almost entirely.

This investigation was elaborated even further. From the 200 individual questions and 100 established scales that were examined for a relationship to career choice, ten scales and two sets of factor scores were selected for more detailed investigation. Both scales and factor scores from this pool related to vocational decision-making in a systematic fashion. Comparatively high scores that stressed "toughness" in the ideological sphere exercised a moderate positive influence on the choice of law, a less consistent but also positive effect on the selection of business, and a substantial negative influence on the choice of academics.

High scores on "intellectualism measures"--a taste for philosophy, critical discussion, artistic and aesthetic endeavors--selected for choice of academics and against that of business.

A specialized interest in the natural sciences worked in favor of a career in medicine or academics, and strongly against the choice of law.

The conclusions conform well to common sense stereotyping. Lawyers are supposed to be aggressive and sociable, just as academics have the reputation of retiring intellectuals, and businessmen are noted for their hard-headed practicality. Moreover, it suggests a possible mechanism through which professions "choose" their appropriate personality types through advertising the conventional stereotypes of their practitioners.

In every career choice except that of medicine, attitudes exercised an absolute influence on vocational decision-making that was approximately as large as the input of early aspirations and college achievement. Second, with the notable exception of business, attitudinal changes <u>during</u> college seemed to carry as much weight as the original freshman scores in their effect on career selection. With the inclusion of attitudinal scales,

more than 25% of the variance in the decision to enter law, business, and academics (and 50% in the case of medicine, due to the overwhelming effects of aspirations) is explained. But whether attitudinal or otherwise, the kinds of "traits" examined here are inadequate proxies for the entire spectrum of events in a life history that bear on career choices. A serious conversation, an inspiring seminar, or a parent's request may leave no permanent traces on attitudes or achievement, and yet, it may be the decisive factor in a real decision.

In an exploration of why students chose their majors and subsequent vocations, how they structured vocational plans, and how they characterized their undergraduate experiences, we found some answers to the following question:

- Who is getting good advice and counsel, as contrasted with those who appear to need such assistance?

- Do we oversimplify the college experience in thinking that it should be directed, happy, and non-anxiety producing?

- Is there a locus of attitudes about career goals that changes over the college years?

Harvard freshmen and seniors claimed to have chosen their concentrations for the same reasons. While State and Junior College seniors reinterpreted their concentration selection, they appeared to have become more interested in the course of their studies and were more inclined to report intellectual interests as the reason for a concentration choice than did the seniors at Harvard. Freshmen at State and Junior College were significantly less inclined to report flexibility of concentration requirements as important and seniors there were more inclined to be careerist.

Career indecision and/or inadequate advising was a grave problem for a modest fraction of alumni. For the majority, Harvard seems to do an adequate job. Yet we cannot afford to ignore the 13% who do cite career indecision as a major source of frustration, for their complaints often made up in bitterness what they lacked in numbers.

Freshmen expect much more from Harvard in the sphere of career advising than seniors report obtaining; Harvard freshmen are in for a major disappointment with many of the institutional sources of vocational aid. Senior evaluations fell moderately below freshman expectations on the usefulness of substantive interests developed in the course of academic studies. On a measure of the helpfulness of Harvard's advising system, senior evaluations fell far below freshman expectations. On the extra-institutional scale, no difference emerged between senior evaluations and freshman expectations. Freshman expectations and senior realizations came close to matching one another for the importance of input from parents, relatives, and family friends; paid work experience; extracurricular activities; leaves of absence; and course reading. Freshmen are doomed for disappointment in their expectations about the helpfulness of contact with faculty, tutors within field of concentration, house pre-professional advisors, the Office of Career Services and Off-Campus Learning, and freshman advisors. Differences between freshmen and seniors might be explained in terms of a generalized freshman optimism. Harvard's greatest service seems to be in generating broad interests rather than in providing more narrowly useful technical advice.

The alumni data indicated that Harvard both helps and influences academics most in the choice of a career. Academics mentioned their career decision significantly more often as the single best feature of Harvard,

as the single most satisfying aspect, and as the single most important long-term influence. In contrast, businessmen, lawyers and people outside the mainstream professions consistently report that Harvard had the least influence on their occupational choice.

Freshman and senior pre-meds showed the greatest absolute certainty in their vocational plans--a finding that corresponds perfectly to the relative predictability of the medical career choice. But more surprising is the fact that senior pre-meds also reported the largest increase in certainty about their career decision from freshman to senior year.

The prospective occupational groups which showed the least increase in career certainty were, not surprisingly, the non-conventional professions (e.g., art-media, government, and "others") and academics; what makes this finding more provocative is that these groups are the "poorest" in terms of certainty to start with. Pre-academics and aspirants to the non-conventional occupations had the lowest evaluations of the helpfulness of the Harvard advising systems, while lawyers and doctors claimed to have received the most from the official guidance system.

To sum up:

- Regarding overall effects, Harvard serves the major occupations equally well and, from self-reports, neglects those who enter the non-conventional occupations.

- With regard to who has the most career certainty as freshmen and who gains, pre-meds, trailed by business and law aspirants, are the clear winners.

- These pre-professionals are also the major benefactors of Harvard's official guidance system.

- Regarding long-term occupational effects, academics benefit the most.

We also asked students to select adjectives best characterizing their undergraduate experiences. Harvard students described their college experience as substantially more anxious than did other students at Junior College and State. Harvard students showed no difference by class. Among the other two schools, anxiety increased modestly from the freshman to the senior year.

Junior College, Harvard and State fell into a continuum, with students at State using the least positive adjectives for the college experience, and Junior College students the most positive. Harvard was not significantly lower than Junior College. Happiness ratings did not follow the ratings for overall satisfaction with the college experience. Satisfaction showed a freshman-senior rise for both Harvard and the other schools; and, for both freshmen and seniors, Harvard students reported much satisfaction than did the students of the other schools.

Harvard students placed less stress on social status and financial security than did other students, perhaps because Harvard students felt more assured of achieving them.

Free time and flexibility became much more important to Harvard students from freshman to senior year. Harvard freshmen started out with the lowest emphasis on free time in their careers, while Harvard seniors ended up with the greatest stress on these extrinsic rewards. Other students did not change from the freshman to senior samples, but in general were closer to Harvard seniors than to Harvard freshmen.

In general, Harvard students valued individual development and creativity as career goals more than did students from the other two schools.

For all students there was a significant freshman-senior year change in favor of greater stress on individual development and creativity as a career goal.

Harvard students tended to be much less rigid in thinking about vocational choice than other students. Harvard seniors had the strongest aversion of all to thinking about careers as a "once in a lifetime decision," whereas there was no significant change from the freshman to senior year samples for other students.

At all three colleges, freshmen claimed that first-hand experience with the work had influenced their thinking about vocational choice.

Harvard freshmen came with high expectations of college and a lot of anxiety about careers. They expected college to be a major influence on their career choice; they expected to find new career interests at Harvard; and they expected that personal counsel from a trusted advisor would make a difference in their choice. Other freshmen entered college with much lower expectations, but other seniors tended to find that college made more of a difference than the other freshman sample had anticipated. In contrast, Harvard seniors stressed the input of college less.

Harvard freshmen started out the most convinced that all careers required graduate training; other freshmen wanted graduate training the least. By senior year, Harvard students were still the most desirous of graduate training, but the gap had narrowed considerably. Radcliffe freshmen started out convinced that graduate school was necessary for their careers. While both Harvard males and Radcliffe females became more willing to dispense with graduate school from the freshman to senior year, only the Radcliffe change was statistically significant.

Harvard freshman had extraordinarily high expectations of developing career interests in the course of their studies. The expectations of "other" freshmen proved realistic, while those of Harvard freshmen did not.

Harvard freshmen had extraordinarily high expectations about the career counsel and information they would receive from faculty members, the Office of Career Services and Off-Campus Learning, and Harvard alumni. The expectations of State freshmen were much lower and proved to be realistic.

Humanities concentrators placed much more stress on job flexibility and free time as a career goal while social scientists placed the greatest emphasis on helping others and working for social change.

Another study of graduates attempted to determine if personality measures assessed at the age of 18 were related to life outcomes of women at the age of 31. The sample was drawn from Radcliffe and another highly selective private women's coordinate college. Data collected 13 years earlier were analyzed for motives (n Achievement, n Affiliation, n Power) and expressions of personality style (fear of success and self-definition). To what extent were these variables useful in helping to explain immediate post-college decisions and later roles as wife, mother and employed professional? Since there appeared to be a sizeable interaction between personality characteristics and institutional "press," we examined the way the colleges' environments were seen by these women. Radcliffe was viewed as a demanding and non-supportive environment which instilled into its graduates a sense of standards and goals. The other college was perceived as emphasizing the social aspects of the college environment and as providing a friendly and pleasant milieu for intellectual development.

Self-definition in the two groups of women produced widely different results depending upon the colleges at which they had studied. Radcliffe graduates with high self-definition produced women who became highly involved in careers and graduate training and placed these activities above family concerns. Graduates of the supportive college did not follow this path; instead (especially when associated with the fear of success variable), they were more likely to be immersed in the traditional feminine family role--bearing children and avoiding the labor force.

Another example of the impact of college "press" was that a high need for affiliation predicted marriages among women from the non-supportive college environment, while it predicted marriage and immediate childbearing among women from the supportive environment. It was especially interesting that a high need for achievement found in stories written 13 years earlier was a good predictor of achievement later; these women, regardless of family obligation, were much more likely to be employed in a full-time position. The interaction of college press and personality traits played an important role in student development, which has a lifetime effect.

A final note: Some people may question our approaches and others our findings. Let me comment briefly on them in that order. The TAT has been both a rich source of data and a rich source of humor, depending on one's school of thought. The absence of reliabiltiy has bothered many of the psychometrically oriented. The scoring systems derived as part of this work are highly reliable, but that in no way ensures that students upon retesting would present the same themes--which is the fundamental test of reliability. As a matter of fact, there is some evidence to indicate that the TAT is not a suitable test to be used in a test-retest format. Because a vast majority of these students were being asked for the first

time for a projective response, and because the data which was analyzed for groups was not individual, the possibility of low reliability should not have made a marked influence on the findings. In addition, only a few of the variables in the study were based on projective data. While a number of tests required open-ended responses--such as analysis of argument and the test of logic and rhetoric--the scoring was not in any way based on a projective theme.

The dimensions that can be explored by techniques having a projective component are so central to the politics of liberal education and are so generally provocative that we invite others to join us in trying to replicate these findings. If they can be corroborated, it will constitute a rich addition to our store of information about college life.

A second area needing special comment is the findings themselves. It may appear to some that we believe that we have proven that private education is superior to public education. Our evidence is far too limited to support such a statement. While it is true that four years at Harvard seemed to produce in students a number of changes normally defined as part of a liberal education, Harvard achievements are not those by which State and Junior colleges should necessarily be evaluated. It would be unfortunate if this work, which constitutes what we feel is an exciting beginning, became derailed over an unjustified claim about the differences in public and private education.

Central to the project have been five themes which seem so robust that we have confidence that they will be replicated.

1. College major is important, not only because of mastery of the information and ideas students acquire about an intellectual domain, but

because of the long-term cognitive style they develop and the special ability they acquire for learning material in that domain.

2. The liberal arts influence of a college seems first to be a function of a variety of interpersonal learning situations (extracurricular activities, interaction with peers and faculty), and secondly, to come from traditional course work. Other opportunities for learning contributed negligibly to these broadening and liberalizing effects.

3. Learning styles appear to be associated with future occupation much more closely than background characteristics, e.g. early aspirations and family status, which fade over the years.

4. Students' abilities to present an organized, logical, forceful argument increase over the college years. Even though seniors do not have an ability to write effective, clear prose with dispatch, they are better than freshmen.

5. The moral and ethical concerns of students increased during college, but the fact that so few achieved a principled perspective invites a major re-examination of the role a college might appropriately play in this domain.